DIVISION 9

SECTION 3109F - PIPING AND PIPELINES

3109F.1 General. *This Section provides minimum engineering standards for piping, pipelines, valves, supports and related appurtenances at MOTs. This Section applies to piping and pipelines used for transferring:*

1. *Oil (see subsection 3101F.1) to or from tank vessels or barges*
2. *Oil within the MOT*
3. *Vapors, including Volatile Organic Compounds (VOCs)*
4. *Inerting or enriching gases to vapor control systems*

Additionally, it also applies to piping or pipelines providing services, which includes stripping, sampling, venting, vapor control and fire water.

See subsection 3101F.3 for definitions of "new" (N) and "existing" (E).

3109F.2 Oil Piping and Pipeline Systems. *All pressure piping and pipelines for oil service shall conform to the provisions of API Standard 2610 [9.1], ASME B31.3 [9.2] or B31.4 [9.3] as appropriate, including the following:*

1. *All piping/pipelines shall be documented on current P&ID's (N/E).*
2. *Piping and pipeline systems shall be installed above deck (N).*
3. *The systems shall be arranged in a way not to obstruct access to and removal of other piping components and equipment (N).*
4. *Flexibility shall be achieved through adequate expansion loops or joints (N/E).*
5. *A guide or lateral restraint shall be provided just past the elbow where a pipe changes direction in order to minimize excessive axial stress (N).*
6. *Piping shall be routed to allow for movement due to thermal expansion and seismic displacement, without exceeding the allowable stresses in the supports, and anchor connections (see subsection 9.3) (N/E).*
7. *Plastic piping shall not be used unless designated for oil service (N/E).*
8. *If a flanged connection exists within 20 pipe diameters from the end of any replaced section, the pipe shall be replaced up to and including the flange.*
9. *Pipelines shall be seamless, electric-resistance-welded or electric-fusion-welded and conform to ASME B31.4. [9.3] (N)*
10. *Piping greater than 2 inches in diameter shall be butt-welded. Piping 2 inches and smaller shall be socket welded or threaded.*
11. *Pipeline connections directly over the water shall be welded (N). Flanged connections not over water shall have secondary containment (N).*
12. *Pipelines that do not have a valid and certified Static Liquid Pressure Test (SLPT) [9.4] shall be marked "OUT OF SERVICE". Out-of-service piping and pipelines shall be purged, gas-freed and physically isolated from sources of oil.*
13. *If a pipeline is "out-of-service" for 3 or more years, it will require Division approval prior to re-use.*

3109F.3 Pipeline Stress Analysis (N/E). *Pipeline stress analysis shall be performed for:*

1. *New piping and pipelines*
2. *Significant re-routing/relocation of existing piping*
3. *Any replacement of "not in-kind" piping*
4. *Any significant rearrangement or replacement of "not in-kind" anchors and/or supports*
5. *Significant seismic displacements calculated from the structural assessment*

Piping stress analysis shall be performed in accordance with ASME B31.4 [9.3], considering all relevant loads and corresponding displacements determined from the structural analysis described in Section 3104F.

Flexibility analysis for piping, considering supports, shall be performed in accordance with ASME B31.4 [9.3] by using the largest temperature differential imposed by normal operation, start-up, shutdown, or abnormal conditions. Thermal loads shall be based upon maximum and minimum local temperatures; heat traced piping shall use the maximum attainable temperature of the heat tracing system.

To determine forces at sliding surfaces, the coefficients of static friction shown in Table 31F-9-1 shall be used.

TABLE 9-1

COEFFICIENTS OF STATIC FRICTION

Sliding Surface Materials	***Coefficient of Static Friction***
Teflon on Teflon	*0.10*
Plastic on Steel	*0.35*
Steel on Steel	*0.40*
Steel on Concrete	*0.45*
Steel on Timber	*0.49*

3109F.4 Anchors And Supports. *Anchors and supports shall conform to ASME B31.3 [9.2], ASME B31.4 [9.3], API Standard 2610 [9.1] and the ASCE Guidelines [9.5](N).*

A seismic assessment shall be performed for existing anchors and supports using recommendations in Section 7 of CalARP [9.6] or Chapter 11 of FEMA 356 [9.7], as appropriate (E).

3109F.5 Appurtenances

3109F.5.1 Valves and Fittings. *Valves and fittings shall meet the following requirements:*

1. *Conform to ASME B 31.4 [9.3], API Standard 609 [9.8], and ASME B16.34 [9.9], as appropriate, based on their service (N).*
2. *Conform to Section 8 of [9.1] (N/E).*
3. *Stems shall be oriented in a way not to pose a hazard in operation or maintenance (N/E).*
4. *Non-ductile iron, cast iron, and low-melting temperature metals shall not be used in any hydrocarbon service, fire water, or foam service (N/E).*
5. *Double-block and bleed valves shall be used for manifold valves. (N/E).*
6. *Isolation valves shall be fire-safe, in accordance with API Standard 607 [9.10] (N).*
7. *Swing check valves shall not be installed in vertical down-flow piping (N/E).*
8. *Pressure relief devices shall be used in any closed piping system that has the possibility of being over pressurized due to temperature increase (thermal relief valves) or surging (N/E).*
9. *Pressure relief devices shall be sized in accordance with API RP 520 [9.11] (N). Set pressures and accumulating pressures shall be in accordance with [9.11] (N).*
10. *Discharge from pressure relief valves shall be directed into lower pressure piping for recycling or proper disposal. Discharge shall never be directed into the open environment, unless secondary containment is provided (N/E).*
11. *Threaded, socket-welded, flanged and welded fittings shall conform to Section 8 of [9.1] (N/E).*

3109F.5.2 Valve Actuators (N/E).

1. *Actuators shall have a readily accessible, manually operated overriding device to operate the valve during a power loss.*
2. *Torque switches shall be set to stop the motor closing operation at a specified torque setting*
3. *Limit switches shall be set to stop the motor opening operation at a specified limit switch setting.*
4. *Critical valves shall be provided with thermal insulation. The insulation shall be inspected and maintained at periodic intervals. Records of thermal insulation inspections and condition shall be maintained for at least 6 years.*
5. *Electrical insulation for critical valves shall be measured for resistance following installation and re-tested periodically. These records shall be maintained for at least 6 years.*

3109F.6 Utility and Auxiliary Piping Systems. *Utility and auxiliary piping includes service for:*

1. *Stripping and sampling*
2. *Vapor control*
3. *Fire water and foam*
4. *Natural gas*
5. *Compressed air, venting and nitrogen*

Stripping and sampling piping shall conform to subsection 3109F.2 (N/E).

Vapor return lines and VOC vapor inerting and enriching (natural gas) piping shall conform to 33 CFR 154.808 [9.12], and API RP 1124 [9.13] (N).

Firewater and foam piping and fittings shall meet the following requirements:

1. *Conform to ASME B 16.5 [9.14]*
2. *Fire mains shall be carbon steel pipe (N/E)*
3. *High density polyethylene (HDPE) piping may be used for buried pipelines (N/E)*
4. *Piping shall be color-coded (N/E)*

Compressed air, venting and nitrogen piping and fittings shall conform to ASME B31.3 [9.2] (N).

3109F.7 References

[9.1] American Petroleum Institute (API), 1994, API Standard 2610, "Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities," ANSI/API STD 2610-1994, 1st ed., Washington, D.C.

[9.2] American Society of Mechanical Engineers (ASME), 1998, ASME B31.3, "Process Piping," New York.

[9.3] American Society of Mechanical Engineers (ASME), 1998, ASME B31.4, "Pipeline Transportation Systems For Liquid Hydrocarbons And Other Liquids," New York.

[9.4] 2 CCR 2550 - 2556, 2560 - 2571 (Title 2, California Code of Regulations (CCR), Sections 2550-2556, 2560-2571).

[9.5] American Society of Civil Engineers, 1997, "Guidelines for Seismic Evaluation and Design of Petrochemical Facilities," New York.

[9.6] CalARP Program Seismic Guidance Committee, 1998, "Guidance for California Accidental Release

Prevention (CalARP) Program Seismic Assessments", Sacramento, CA.

[9.7] Federal Emergency Management Agency, Nov. 2000, FEMA 356, "Prestandard and Commentary for the Seismic Rehabilitation of Buildings", Washington, D.C.

[9.8] American Petroleum Institute (API), 1997, API Standard 609, "Butterfly Valves: Double Flanged, Lug- and Wafer-Type," 5th ed., Washington, D.C.

[9.9] American Society of Mechanical Engineers (ASME), 1996, ASME B16.34, "Valves Flanged Threaded And Welding End," New York.

[9.10] American Petroleum Institute (API), 1996, API Standard 607, "Fire Test for Soft-Seated Quarter-Turn Valves," 4th ed., 1993 (reaffirmed 4/1996), Washington, D.C.

[9.11] American Petroleum Institute (API), 2000, API RP 520, "Sizing, Selection, and Installation of Pressure-relieving Devices in Refineries, Part I – Sizing and Selection, 7th ed., and Part II – Installation, 2003, 5th ed., Washington, D.C.

[9.12] 33 CFR 154.808 – Vapor Control Systems, General (Title 33, Code of Federal Regulations (CFR), Section 154.808).

[9.13] American Petroleum Institute (API), 1991, Recommended Practice 1124 (API RP 1124), "Ship, Barge, and Terminal Hydrocarbon Vapor Collection Manifolds," 1st ed., Washington, D.C.

[9.14] American Society of Mechanical Engineers (ASME), 1996, ASME B16.5," Pipe Flanges and Flanged Fittings," New York.

Authority: Sections 8755 and 8757, Public Resources Code.

Reference: Sections 8750, 8751, 8755 and 8757, Public Resources Code.